# **ZOOTAXA**



Morphological and phylogenetic study of the Western Atlantic Crepidula plana complex (Caenogastropoda, Calyptraeidae), with description of three new species from Brazil

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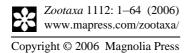
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#### ZOOTAXA

#### **Abstract**



A detailed morphological study was performed in the following species of Crepidula: 1) C. margarita new species from Venezuela; 2) C. plana Say, 1822; 3) C. atrasolea Collin, 2000; 4) C. depressa Say, 1822, from Florida, USA; 5) C. pyguaia, new species from Santa Catarina coast, Brazil; 6) C. carioca, new species from Rio de Janeiro coast, Brazil. Additionally, five other species anatomically studied in Simone (2002) were also included: 7) C. argentina Simone, Pastorino & Penchaszadeh, 2000, from Argentina; 8) C. glauca Say, 1822, from Venezuela; 9) C. fornicata (Linné, 1758), from Mediterranean and Florida; 10) C. protea Orbigny, from S.E. Brazil; 11) C. aff. plana, here described as C. intratesta new species, from S.E. Brazil; 12) C. cachimilla Cledón Simone & Penchaszadeh, 2004, from Patagonia. The 46 characters (106 states) for these species were phylogenetically analyzed and a single cladogram was obtained (length: 93, CI: 65; RI: 64) as follows: (Crepidula cachimilla (C. argentina ((C. carioca C. pyguaia) ((C. fornicata (C. intratesta C. protea)) ((C. glauca C. margarita) (C. plana (C. atrasolea C. depressa))))))). Two outgroups were used: Bostrycapulus aculeatus (Gmelin, 1791), which most authors consider a Crepidula (operationally analyzed as part of the ingroup), and the remaining calyptraeoideans studied by the author. The monophyly of the ingroup is confirmed, supported by 25 morphological synapomorphies. Although the ingroup is fully resolved, no clades are formally named, because the phylogeny is still considered provisional. Most studied species belong to an informal group called "Crepidula plana-complex", but it is not monophyletic, since C. fornicata, which does not belong to this complex, is part of the ingroup. This study demonstrates that detailed morphological data are useful in phylogenetic studies even at the level of closely related/sibling species, resulting in cladogram with good resolution and a good number of shared, analyzable characters. A biogeographic analysis is also performed considering the distribution of each species under the light of the obtained cladogram, a clear ascension from south to north is the main pattern of the evolutionary history of these species. Further comments on the systematics of Crepidula aplysioides Reeve and C. convexa Say is also performed.

**Key words**: Gastropoda, Caenogastropoda, Calyptraeidae, West Atlantic, Phylogeny, Biogeography, new species

#### Introduction

The *Crepidula plana* complex is defined here as a set of species that occurs in the Western Atlantic. This group of species is difficult to separate by means of shell characters alone and, sometimes, even by anatomical characters. The status of those species, at least the known ones, varies from truly separated species to synonyms of *C. plana* Say, 1822. Collin (2000) was the first to use the term, encompassing Florida species with pale, smooth, flat shell. The concept is extended here for the Western Atlantic that possibly sets closey related species, and to differentiate from the "*C. plana* group" as mentioned by Hoagland (1977) that sets convergent whitish species.

The more we know about those populations, the more the result is the fragmentation in several species. Further studies of those populations indicates/suggests that multiple

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4) The methodology of studying detailed morphology is demonstrated to be useful at all levels, from high ranks, to species belonging to same genus, occurring in same geographical area and hardly separated in shell characters.

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